

Industrial Light & Magic

(www.ilm.com)

Autodesk® Burn® software

Autodesk® Inferno® software

Autodesk® Maya® software

Project: Indiana Jones and the Kingdom of the Crystal Skull
(www.indianajones.com)

The ability to rapidly build and prototype assets in Autodesk Maya was a huge benefit to this film. Our modelers used Maya to quickly construct, texture, and present great models to Steven [Spielberg] for concept approval. Our animators use Maya to turn around several iterations per day, which is very important when deadlines are tight. All in all, Maya is a great tool to use.

—Jeff White

Associate Visual Effects Supervisor
Industrial Light & Magic

As It Used To Be.

Industrial Light & Magic Makes the Most of New Technology in Steven Spielberg's Indiana Jones and the Kingdom of the Crystal Skull.



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Summary

After nearly twenty years, 65-year-old actor Harrison Ford reprises his iconic role as adventurous archaeologist Dr. Henry “Indiana” Jones with the wry words: “Not as easy as it used to be.”

While Indy is acknowledging both his advanced years and the sizeable group of Russian soldiers with whom he’s about to do battle, he might just as easily be referring to the Visual Effects challenges presented by the latest, longest-awaited collaboration between film legends George Lucas and Steven Spielberg. Visual Effects Supervisor Pablo Helman, together with his Associate Visual Effects Supervisor, Jeff White, both of Industrial Light & Magic (ILM) discuss the filmmakers’ advanced knowledge of technology, the film’s ambitious scenes, and how Autodesk® Inferno® and Autodesk® Maya® software helped bring Indiana Jones back to diehard fans and also to a new generation of enthusiasts.

The Challenge

Pablo Helman’s resume over the past decade reads almost like a history of film. From *Independence Day* (1996) to *Terminator 3: Rise of the Machines* (2003); *Jurassic Park: The Lost World* (1997) to *Star Wars: Episode II – Attack of the Clones* (2002); *Saving Private Ryan* (1998) to *Munich* (2005); and *Men in Black* (1997) to *The Spiderwick Chronicles* (2008), Helman has worked as an effects artist and/or supervisor on some of the biggest blockbusters of the last ten years. All that experience, however, couldn’t fully prepare him for the most recent challenge faced by his ILM effects team.

Over the course of approximately 18 months, Helman and his team would rely on ILM’s SABRE system, which is based on Autodesk Inferno and Autodesk Burn software systems, to create 540 shots comprising 48 minutes of screen time, and dealing with mummified aliens, nuclear explosions, chases through jungles, raging waterfalls, ancient temples, and flying saucers.

“There’s been no other project quite like this,” says Helman. “I’ve worked with Steven Spielberg and George Lucas before, but never with both at once. It was an incredible feeling to be part of this franchise and work with such a legendary team, but it was also pretty daunting. On the one hand, we needed to maintain the feeling of the original film trilogy, but the script also called for scenes that simply could not have been accomplished 20 years ago. To bring the look of the past together with almost futuristic effects shots, we needed to combine stunt coordination, visual effects, and other film elements in a truly seamless way. When it comes to digital technology, of course, there are no two filmmakers more on the cutting edge than Steven and George. When they want you to realize their visions, there’s really no place to hide. If you’re not doing the best and most efficient job with your tools, those two will know it.”

“Our biggest challenge was the sheer volume and variety of effects we needed to create,” says Jeff White, Associate Visual Effects Supervisor at ILM and Digital Production Supervisor on the film. “A typical film project presents one or two significant problems to solve, but Indy IV had it all: crowd simulations; massive water simulations; biped, quadruped, and vehicle rigs, jungle reconstruction, and complex digital environments. To top it off, we had to create a huge, believable nuclear explosion that Indy survives! This was definitely not your typical project.”

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And it all began with Autodesk Maya, which was used throughout the project:

“Autodesk Maya is integrated throughout the ILM pipeline,” explains White. “Almost all our character and hard surface models begin in Maya. We then move our models to character setup, where we use blockParty, a volume-based procedural rigging system we’ve developed with the MEL and Python scripting capabilities in Maya. Maya not only provides the extensive library of tools we need for character setup and deformations, the integrated API and scripting languages help us automate many of these processes.”

Like this film’s hero, the intrepid ILM team would need every advantage they could find. Our story begins with some elaborate previsualizations created for the most part in, yes, Maya.

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The Solutions to Waterfalls, Jungles, Monkeys, and More

“We worked with Dan Gregoire of Halon Entertainment on the previsualizations, which were created with Autodesk Maya,” says Helman. “For a lot of reasons, the previz was invaluable. In the beginning, we were able to determine the best approach to creating the effects, and who would be the best people to do them. It was evident from the beginning that no one department would be able to handle everything in a particular scene; that we would have to work together to figure this one out. It was a very complex process in which live action stunt coordination and visual effects worked from a single print. What was more, the previsualizations continued to evolve as the project went on. Even as we got into principal photography, the departments conferred with one another and showed each other tests, and Steven could evaluate the results. It was a great collaboration.”

A seamless combination of live action stunt work and visual effects was vital to a protracted and pulse-pounding chase through jungle foliage. The scene required that Indy, together with his long-lost love Marian (Karen Allen) and recently-discovered son Mutt (Shia LaBeouf) battle dastardly Russians over the Crystal Skull of the title, all while driving various military vehicles through dense jungle.

“We knew the jungle sequence would require a lot of stunt work, but we were also sure that the jungle vegetation would be up to us,” says Helman. “While the stunt people and coordinators can do amazing things, they can’t work in an environment that isn’t flat. We decided early on not to use digital doubles in these scenes, even though it might have been easier, because we wanted to maintain the spirit and look of the original franchise. For the jungle sequence in particular, we concentrated on using our SABRE system for compositing and particle work that would enhance the greenscreen stunt work.”



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An equally spectacular sequence involves the aforementioned actors navigating and surviving a trio of increasingly treacherous waterfalls. Though appearing utterly realistic, the undoubtedly still-spry thespians still required some digital help from Helman and his team:

“The waterfall sequence began with an elaborate helicopter shoot in the wilds of Brazil and Argentina,” says Helman, who supervised the shooting. “The actual waterfalls are far too treacherous for boats, so we shot helicopter plates, along with bridge and boat work against greenscreens. We also shot a lot of water

elements that would be used to fill in the scene where it was needed. With a great previz created in Maya, we were able to create absolutely accurate geographic maps of the waterfalls. Since all the footage was shot looking down from about 60 feet up, however, tracking proved to be a significant challenge. To composite and create the scene, we used a combination of Zeno, which incorporates our proprietary tracking tools, and SABRE to create a seamless look.”

We won't give anything away, but suffice it to say that Indiana Jones and the Kingdom of the Crystal Skull employs plenty of creatures in its storyline. Chief among them are some helpful monkeys and ravenous ants, all of whom come to Indy's aid:

"Both the monkey and ant sequences made extensive use of Maya," says White. "Jacob Buck, on of our Technical Directors, created a system within Maya that enabled our animators to attach and manipulate motion paths to deforming characters using follicle nodes. The animators were able to import match animation, and quickly attach ants to hero animations that supplemented the crowd-based ants crawling all over our human characters. A crowd favorite during dailies was the adventurous CG ant animated to crawl up a villain's nose."

The Results

Working on possibly the most highly-anticipated project in recent film history, Helman, White, and the ILM team happily submitted too many long days over 18 months and, astonishingly, appear to have emerged as unscathed as Indiana Jones himself. That the elaborate projects proceeded so smoothly, Helman attributes to great collaboration, great communication, and yes, great tools:

"Working with Inferno was a natural choice on this project," he says matter-of-factly. "The waterfall sequence, in particular, was a core scene that simply needed the speed and flexibility of Inferno. With the tracking and integration challenges of such an ambitious shot, I needed the flexibility to try things very quickly. Working closely with Dan O'Brien, our SABRE lead, and Chad Taylor was helped by these tools that are truly geared to the communication and collaboration necessary for quick communication."

Asked for his favorite feature in Autodesk Maya, White hesitates before answering:



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"I know it's not that sexy, but the addition of Python scripting to Maya has been a huge windfall here at ILM. We can now write applications that connect to Maya and our proprietary software, and there are incredible libraries of Python modules that we can take advantage of. Through Python, we can connect Maya to our asset management system and our production databases, making for automatic updating of characters and editorial changes."

As to the harrowing experience of working on the film itself, White is totally upbeat:

"It was an unbelievable experience," he says. "Pablo has developed a close working relationship with both Steven Spielberg and George Lucas, which goes a long way to smoothing the process. Steven has such a clear vision of what he wants in a shot, he's the most effective collaborator one can imagine. After so many years making films like this one, Steven is incredibly knowledgeable about the process. He's also just about the nicest person one could hope to work with."

To this reporter's inquiry as to whether Indiana Jones and the Kingdom of the Crystal Skull is the most difficult of his career, Helman wryly quotes Spielberg:

"We were all getting tired of the rigorous schedule, I guess, but Steven insisted 'The work isn't any harder. We're just older.'"

A truism worthy of Indiana Jones himself.

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—Pablo Helman,
Visual Effects Supervisor,
Industrial Light & Magic